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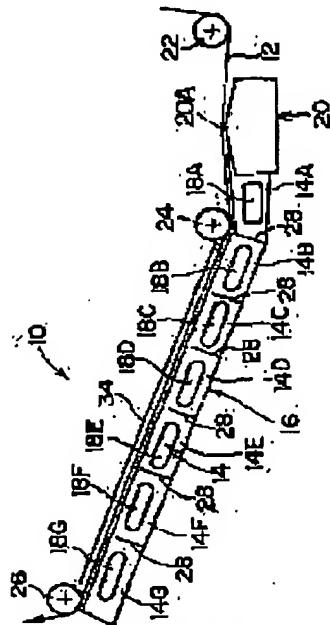
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(54) METHOD AND APPARATUS FOR DRYING COATED FILM



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CLAIMS

[Claim(s)]

[Claim 1] The desiccation approach of the spreading film characterized by to prepare a desiccation zone immediately after said spreading, and to make said desiccation zone generate the desiccation wind of one direction flow of said long-picture-like base material cross direction which flows from one end to another side one end on the other hand in the desiccation approach of the spreading film which applied and formed the coating liquid which contains an organic solvent in the long-picture-like base material it runs while surrounding the spreading film surface by which said long-picture-like base material it runs is dried.

[Claim 2] The desiccation approach of the spreading film according to claim 1 characterized by adjusting the wind speed of the desiccation style which flows to said one direction for each [which divided and divided said desiccation zone into two or more division zones in the transit direction of said long picture-like base material] division zone of every.

[Claim 3] Said desiccation wind is the desiccation approach of the spreading film

according to claim 1 or 2 characterized by including the same solvent gas as said organic solvent.

[Claim 4] It is the desiccation approach of the spreading film of any 1 of claims 1-3 characterized by being that in which said coating liquid contains a liquid crystallinity discotheque compound while having the layer which said long picture-like base material carries out rubbing processing of the resin for orientation film formation applied beforehand, and serves as orientation film.

[Claim 5] In the dryer of the spreading film which applied and formed the coating liquid which contains an organic solvent in the long picture-like base material it runs with a spreading machine The body of a dryer which forms the desiccation zone surrounding the spreading film surface by which it is prepared immediately after said spreading machine, and said long picture-like base material it runs is dried, The dryer of the spreading film characterized by having an one direction air-current generating means to generate the desiccation wind of one direction flow of said long picture-like base material cross direction which flows from one end to another side one end on the other hand, in said desiccation zone.

[Claim 6] Said one direction air-current generating means is the dryer of the spreading film of claim 5 which is formed in the side face of said body of a dryer, and is characterized by having the exhaust air means connected to said opening formed in one end and said another side one end on the other hand, respectively and said another side one end opening of said long picture-like base material cross direction.

[Claim 7] It is the dryer of the spreading film according to claim 5 or 6 characterized by making controllable displacement of an one direction each air-current generating means according to an individual while a batch forms two or more division zones with the dashboard which intersects said desiccation zone perpendicularly in the transit direction of said long picture-like base material and establishing said one direction air-current generating means for every division zone.

[Claim 8] Spacing of the upper limit of said dashboard arranged in this desiccation zone while said desiccation zone was formed so that the field of said spreading film might be surrounded, and said spreading film surface is the dryer of the spreading film of claim 7 characterized by being set as the range of 0.5-12mm.

[Claim 9] It is the dryer of the spreading film of any 1 publication of claims 6-8 characterized by absorbing the desiccation wind containing said solvent gas as said organic solvent from one end opening of said desiccation zone same on the other hand.

[Claim 10] It is the dryer of the spreading film of any 1 publication of claims 5-9 characterized by being that in which said coating liquid contains a liquid crystallinity discotheque compound while having the layer which said long picture-like base material carries out rubbing processing of the resin for orientation film formation applied beforehand, and serves as orientation film.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the desiccation approach of the spreading film, and equipment, and relates to the desiccation approach and equipment which dry a double width spreading film surface in manufacture of an optical compensation sheet etc. especially by the long picture which applied and formed the coating liquid which contains an organic solvent in a long picture-like base material.

[0002]

[Description of the Prior Art] In order to improve an angle-of-visibility property in a liquid crystal display, the optical compensation sheet is prepared as a phase contrast plate between the polarizing plate of a pair, and the liquid crystal cell. The manufacturing method of a long picture-like optical compensation sheet is indicated by JP,9-73081,A, after applying the coating liquid containing the resin for orientation film formation to the front face of a long picture-like bright film, rubbing processing is performed, the orientation film is formed, the coating liquid which contains a liquid crystallinity discotheque compound on the orientation film is applied, and the approach of drying the applied spreading film is indicated.

[0003] The desiccation approach of the coating liquid containing the liquid crystallinity discotheque compound currently indicated by JP,9-73081,A performs initial desiccation under indoor air-conditioning conditions, and he is trying to mainly evaporate the organic solvent in coating liquid after applying the coating liquid containing a liquid crystallinity discotheque compound on this orientation film until it dries with the dryer of normal.

[0004] two kinds of spots (nonuniformity), the broadcloth spots A (a thin line show) as shown in the desiccation process at drawing 4 on the 1st page of the spreading film , and the sharp spots B (a thick line show), A and B occur on the optical compensation sheet manufactured by this approach , and there be a problem of lower the yield of a product by the case in it .

[0005] As a result of analyzing about two kinds of these spots A and B, it turned out that the thickness of the layer of the coating liquid film 2 with which the broadcloth spots A contain a liquid crystallinity discotheque compound as shown in drawing 5 is thin. The sign 3 of drawing 5 is a long picture-like base material, and 4 is an orientation membrane

layer. As the direction 6 of orientation of the orientation section 5 (dark color part) which the sharp spots B have generated on the other hand was shown in drawing 6, it turned out that it has shifted compared with the orientation section 8 of other normal directions 7 of orientation.

[0006] To the spots (nonuniformity) A and B generated in such initial desiccation, as an approach currently generally performed as an effective cure, the viscosity of coating liquid is made to increase by high-concentration-izing coating liquid or adding a thickener, and there is a method of preventing generating of spots by controlling a flow which, and is depended by this. [the spreading film surface immediately after spreading] [of desiccation] As an option, by using a high-boiling point solvent, even if a flow of the paint film side immediately after spreading depended in the style of desiccation occurs, there is a method of preventing generating of spots because the leveling effectiveness arises.

[0007]

[Problem(s) to be Solved by the Invention] However, the approach of increasing the viscosity of coating liquid by high-concentration-izing concentration of coating liquid, or adding a thickener has the fault that super-thin layer precision spreading which forms the overly thin layer spreading film by high-speed spreading cannot be performed. Moreover, since a marginal spreading rate (limitation of the spreading rate which can carry out stable spreading) falls so that coating liquid viscosity increases and high-speed spreading becomes impossible with the increment in viscosity, there is a fault that productive efficiency gets worse extremely.

[0008] On the other hand, the approach using a high-boiling point solvent brings about increase of the drying time, and increase of the amount of residual solvents which remains in the spreading film, and since the drying time starts so much, it has the fault that productive efficiency gets worse.

[0009] This invention was made in view of such a situation, and it aims at offering the desiccation approach and equipment which can dry the spreading film to homogeneity, without changing the class of physical properties, such as viscosity of coating liquid, or solvent.

[0010]

[Means for Solving the Problem] This invention prepares a desiccation zone immediately after said spreading in the desiccation approach of the spreading film which applied and formed the coating liquid which contains an organic solvent in the long-picture-like base material it runs in order to attain said purpose, and it is characterized by to make said desiccation zone generate the desiccation wind of one direction flow of said long-picture-like base material cross direction which flows from one end to another side one end on the other hand while it surrounds the spreading film surface by which said long-picture-like base material it runs is dried.

[0011] Moreover, this invention is set to the dryer of the spreading film which applied and formed the coating liquid which contains an organic solvent in the long picture-like base material it runs with a spreading machine, in order to attain said purpose. The body of a dryer which forms the desiccation zone surrounding the spreading film surface by which it is prepared immediately after said spreading machine, and said long picture-like base material it runs is dried, It is characterized by having an one direction air-current generating means to generate the desiccation wind of one direction flow of said long

picture-like base material cross direction which flows from one end to another side one end on the other hand, in said desiccation zone.

[0012] According to this invention, after spreading, it is having prepared the desiccation zone immediately after spreading preferably, and while being able to prevent the uneven wind of the strength from the outside of a desiccation zone, or a direction from hitting the spreading film surface in the condition that hidden coating liquid tends to flow an organic solvent mostly, a wrap desiccation environment is formed for the organic solvent which evaporated from the spreading film surface in a spreading film surface. Under this desiccation environment, since the spreading film can be dried where the organic solvent concentration near the spreading film surface is always maintained uniformly if the regular desiccation wind of 1 direction flow of the long picture-like base material cross direction which flows at an another side edge from an edge on the other hand is generated, the above-mentioned generating of two kinds of spots (nonuniformity) at the time of desiccation can be prevented, and uniform desiccation can be performed.

[0013]

[Embodiment of the Invention] Hereafter, it explains in full detail by the accompanying drawing about the desiccation approach of the spreading film of this invention, and the gestalt of desirable operation of equipment.

[0014] Drawing 1 is the side elevation of the dryer of the spreading film of this invention, and drawing 2 is the top view which looked at drawing 1 from the upper part.

[0015] As shown in drawing 1 and drawing 2, on the other hand, the dryer 10 of the spreading film of this invention is constituted by one direction air-current generating means 18 generate the desiccation wind of the 1 direction flow of the web 12 cross direction which flows from one end to another side one end, the body 16 of a dryer which forms the desiccation zone 14 where the long picture-like base material 12 (henceforth "a web 12") it runs is passed, and desiccation of the spreading film is performed, and mainly in the desiccation zone 14. This dryer 10 is formed immediately after the spreading machine 20 which applies the coating liquid which contains an organic solvent in the web 12 it runs.

[0016] Coating liquid is applied to the inferior surface of tongue of the web 12 can use the bar coater equipped with wire bar 20A as a spreading machine 20, for example, and it runs by being supported by two or more backup rollers 22, 24, and 26, and the spreading film is formed in it.

[0017] the merit who the body 16 of a dryer was established immediately after the spreading machine 20, and met the spreading film surface side (inferior-surface-of-tongue side of a web) of the web 12 it runs -- it is formed in the shape of [square] a box, and the side by the side of the spreading film surface of each side of a box (surface of a box) is excised. The desiccation zone 14 surrounding the spreading film surface by which the web 12 it runs is dried by this is formed. The desiccation zone 14 is divided into two or more division zones 14A, 14B, 14C, 14D, 14E, 14F, and 14G (this example seven division zones) by dividing the body 16 of a dryer with two or more dashboards 28 and 28 -- which intersected perpendicularly in the transit direction of a web 12. In this case, the range of 0.5mm - 12mm is desirable still more desirable, and the range of the distance of the upper limit of a dashboard 28 which divides the desiccation zone 14, and the spreading film surface formed in the web 12 is 1mm - 10mm. Moreover, the one direction air-current generating means 18 (R> drawing 2 2 reference) is formed in the

desiccation zone 14.

[0018] The inlet port 18A, 18B, 18C, 18D, 18E, 18F, and 18G by which the one direction air-current generating means 18 was mainly formed in the one side of the both-sides side of the body 16 of a dryer, It consists of exhaust ports 18H, 18I, 18J, 18K, 18L, 18M, and 18N which countered inlet port 18A-18G, and were formed in the other side, and exhaust air means 18P, 18Q, 18R, 18S, 18T, 18U, and 18W connected to exhaust ports 18H-18N. Since the air absorbed by the division zones 14A-14G from inlet port 18A-18G by this by making the exhaust air means 18P-18W drive is exhausted from exhaust ports 18H-18N, in each division zones 14A-14G, the desiccation wind of the web 12 cross direction which flows from one end (inlet port side) to an one direction towards another side one end (exhaust-port side) on the other hand occurs. this one direction air-current generating means 18 -- the exhaust air means 18P-18W -- the division zones 14A-14 -- displacement can be separately controlled now for every G. The air-conditioning wind which is absorbed from inlet port 18A-18G and by which temperature and humidity were air-conditioned if the style of desiccation is desirable.

[0019] Moreover, the width of face of the body 16 of a drycr is formed so that it may become larger than the width of face of a web 12, and the ready wind part which covered the open part of the both sides of the desiccation zone 14 with the air register board 32 was prepared. This ready wind part is carried out that it is easy to absorb in the exhaust-port 18 Mika desiccation zone 14 whose desiccation wind is inlet port 18A-18G while securing the distance to H-18N from the distance and the spreading membrane end from inlet port 18A-18G to a spreading membrane end, and it is made not to make the rapid flow of the desiccation style in the desiccation zone 14. As die length of this ready wind part 32, i.e., an air register board, the inlet port and exhaust-port side of the range of 50mm or more 150mm or less is desirable.

[0020] It is important for division zone 14A nearest to especially a spreading machine among each division zones 14A-14G to make it hard to enter the desiccation zone 14 immmediately after applying coating liquid to a web 12, the fresh air, for example, above-mentioned air-conditioning wind, outside the desiccation zone 14. For that, it is desirable to constitute the open section of division zone 14A from a web 12 so that it may cover as the location of wire bar 20A of the spreading machine 20 and the location of a backup roller 24 other than arranging division zone 14A or the above mentioned air register board 32 are adjusted so that the spreading machine 20 may be adjoined, and a web 12 runs the latest of division zone 14A.

[0021] Moreover, a web 12 is inserted, and a shield 34 is formed in the opposite side location of the body 16 of a dryer so that stable transit of a web 12 may not be checked by winds, such as said air-conditioning wind.

[0022] Next, an operation of the constituted dryer 10 is explained like the above.

[0023] In addition, a web 12 explains coating liquid in the example of the organic solvent nature coating liquid containing a liquid crystallinity discotheque compound while having the layer which carries out rubbing processing of the resin for orientation film formation applied beforehand, and serves as orientation film.

[0024] Initial desiccation of a spreading film surface is performed by the dryer 10 immediately after applying coating liquid to the web 12 it runs by being supported by backup rollers 22, 24, and 26 by wire bar 20A of the spreading machine 20. As for this initial desiccation, it is desirable to start the desiccation depended in the style of

desiccation immediately after spreading for less than 5 seconds at the latest immediately after spreading.

[0025] In this initial desiccation, the spreading film surface immediately after spreading is in the condition that the organic solvent was fully contained, and temperature distribution generate it in a spreading film surface according to distribution (fluctuation) of evaporation of an organic solvent in initial desiccation immediately after applying the coating liquid which uses especially an organic solvent as a solvent. Distribution of surface tension occurs owing to this, a flow of coating liquid occurs within a spreading film surface, and the spreading film of the late part of desiccation becomes thin, and serves as the broadcloth spots (nonuniformity) A.

[0026] moreover, although the direction of orientation of a liquid crystallinity discotheque compound carried out rubbing processing and have determine the front face of the rcsin for orientation film formation, when the wind speed of a different wind from the direction of rubbing in initial desiccation be quick and a wind join, it make a part of spreading film surface produce a gap of the direction of orientation because winds when the eddy of a wind have occur hit a spreading film surface, and cause spots (nonuniformity) B with this sharp.

[0027] While preventing that the uneven wind from the outside until a flow of the paint film liquid in a spreading film surface stops hits a spreading film surface during initial desiccation after applying in order to prevent the spots (nonuniformity) A and B of the spreading film surface at the time of initial desiccation from this, it becomes important to always keep constant the organic solvent concentration near the spreading film surface.

[0028] So, in this invention, immediately after applying coating liquid to a web 12, in order to perform initial desiccation, the dryer 10 of the above-mentioned configuration was formed. That is, the uneven wind of the strength outside the desiccation zone 14 or a direction can be prevented from hitting the spreading film surface in the condition that hidden coating liquid tends to flow mostly, in an organic solvent by having formed the desiccation zone 14 immediately after spreading. That the direction of orientation of a spreading film surface shifts by this under the influence of the wind which hit the spreading film surface can prevent the sharp spots (nonuniformity) B generated owing to, and it can perform uniform desiccation.

[0029] Moreover, a wrap desiccation environment is formed for the organic solvent which evaporated from the spreading film surface in a spreading film surface by having formed the desiccation zone 14. If the exhaust air means 18P-18W are made to drive, since the air absorbed by the division zones 14A-14G from inlet port 18A-18G will be exhausted from exhaust ports 18H-18N under this desiccation environment, in each division zones 14A-14G, the desiccation wind of the web width direction which flows from one end (inlet port side) to an one direction towards another side one end (exhaust-port side) on the other hand occurs. Thereby, with the condition that the spreading film surface was covered by the organic solvent, the desiccation air containing the organic solvent which evaporated is exhausted from exhaust ports 18H-18N, and is dried gradually. In this case, since an organic solvent stops covering a spreading film surface equally when the displacement of the exhaust air means 18P-18W is too large, the displacement of the exhaust air means 18P-18W is adjusted, and it is necessary to make it displacement not become large too much. Thereby, since organic solvent concentration [/ near the spreading film surface] can be equalized, an organic solvent can be equally

evaporated from each part of a spreading film surface. Therefore, evaporation distribution of the organic solvent from a spreading film surface can prevent the broadcloth spots (nonuniformity) A generated owing to, and can perform uniform desiccation.

[0030] In this case, although the organic solvent concentration near [in the entrance side and outlet side of the desiccation zone 14] the spreading film surface may differ to a web 12 running the desiccation zone 14, the desiccation zone 14 is cancelable by having divided into two or more division zones 14A-14G. That is, the difference in the organic solvent concentration near [in the entrance side and outlet side of the desiccation zone 14] the spreading film surface is cancelable by controlling the displacement of each exhaust air means 18P-18W formed in each division zones 14A-14G divided into seven, and adjusting the wind speed of the desiccation style which flows each division zones 14A-14G. Thereby, good desiccation which generates neither the broadcloth spots (nonuniformity) A nor the sharp spots (nonuniformity) B can be performed to a spreading film surface.

[0031] Furthermore, each exhaust air precision of each exhaust air means 18P-18W formed in each division zones 14A-14G can be made to raise by setting spacing of the upper limit of a dashboard 28, and a spreading film surface to 0.5mm - 12mm, in order to control the flow of the desiccation style, and making it as narrow as possible in the range in which a spreading film surface does not hit a dashboard 28. Moreover, it was made for the flow of the wind containing the solvent which flows a spreading film surface by rectifying the wind which forms an air register board 32 and flows into the bottom of the web of the both-sides section of the desiccation zone 14 from inlet port 18A-18G, and the wind exhausted from exhaust ports 18H-18N to become uniform. In addition, although the dryer 10 was installed, for example, air-conditioning winds, such as an air conditioned room, can be used if the style of desiccation, you may make it inhale the wind containing the same solvent as the organic solvent contained in coating liquid from the inlet port 18A-18G of the body 16 of a dryer. Or the part of the desiccation style exhausted by the exhaust air means 18P-18W may be inhaled from inlet port 18A-18G.

[0032] Generally as a web 12 used by this invention, width of face 0.3-5m, die length 45-10000m, Polyethylene terephthalate with a thickness of 5-200 micrometers, polyethylene-2, 6 naphthalate, Cellulose die acetate, cellulose triacetate, cellulose acetate propionate, A polyvinyl chloride, a polyvinylidene chloride, a polycarbonate, polyimide, Plastic film, such as a polyamide, paper, polyethylene, polypropylene, The thing which made the preliminary processing layer form in the front face of band-like or base materials, such as metallic foils, such as paper in which the carbon number of an ethylene butene copolymer etc. applied or laminated alpha-polyolefins of 2-10, aluminum, copper, and tin, is contained. Furthermore, after optical compensation sheet coating liquid, magnetic coating liquid, photograph photosensitivity coating liquid, a surface protection, electrification prevention, or the coating liquid for slippage is applied to the front face and dried by the above mentioned web 12, what is judged by the die length and width of face for which it asks is contained in it, and an optical compensation sheet, various photographic films, printing paper, a magnetic tape, etc. are mentioned to it as these examples of representation.

[0033] As the method of application of coating liquid, the others and curtain coating method, an extrusion coating method, the roll coating method, a DIP coating method, a spin coating method, a printing coating method, a spray coating method, and a slide

coating method can be used. [coating method / above-mentioned / bar] A bar coating method, an extrusion coating method, and a slide coating method can use it suitably especially.

[0034] Moreover, the number of the spreading layers of the coating liquid applied to coincidence in this invention is not limited to a monolayer, and can be applied also to the coincidence multilayer method of application if needed.

[0035]

[Example] Drawing 3 built the dryer 10 of this invention into the production process of an optical compensation sheet, and investigated the effectiveness at the time of adjusting the displacement of each exhaust air means 18P-18W of a dryer 10 by relation with the generating situation of the spots (nonuniformity) of the manufactured optical compensation sheet.

[0036] About the displacement of each exhaust air means 18P-18W of a dryer 10, it carried out about three examples of 1-3 of Table 1, and the wind speed of the desiccation style which flows each division zones 14A-14G in each example was shown in Table 1.

[0037] First, if the production process of an optical compensation sheet is explained, being supported by two or more guide idlers 42 and 42 -, the web 12 sent out with the sending-out machine 40 like drawing 3 will pass the rubbing processor 44, the spreading machine 20 and the dryer 10 of this invention which performs initial desiccation, the desiccation zone 46 that performs this desiccation, the heating zone 48, and an ultraviolet ray lamp 50, and will be rolled round with a reel 52.

[0038] As a web 12, triacetyl cellulose (FUJITAKKU, Fuji Photo Film Co., Ltd. make) with a thickness of 100 micrometers was used. And it is the amount percent solution of duplexes of long-chain alkyl denaturation poval (MP-203, Kuraray Co., Ltd. make) to the front face of a web 12 Film 1m2 After 25ml spreading of hits, carrying out conveyance transit of the web 12 in which the resin layer for orientation film which was dried for 1 minute and built with 60-degreeC was formed, by part for 18m/, rubbing processing was performed on the resin layer front face, and the orientation film was formed in it. For the forcing pressure of the rubbing roller 54 in rubbing processing, an orientation film resin layer is 2 1cm. While considering as 98Pa (10 k gf/cm²) of hits, rotation peripheral speed was carried out in 5.0m/second.

[0039] And as coating liquid, the coating liquid containing the liquid crystallinity compound which uses a photopolymerization initiator (the IRUGA cure 907, Ciba-Geigy Japan manufacture) as the 40-% of the weight methyl-ethyl-ketone solution of the mixture added one percent by weight to said mixture was used for the mixture of 4:1 by the weight ratio of (5) of (3) of discotheque compound TE-8, and TE-8 on the orientation film obtained by carrying out rubbing processing of the resin layer for orientation film. The amount of coating liquid is this coating liquid on the orientation film, making it run a web 12 by part for travel-speed/of 18m Web 1m2 It applied by wire bar 20A so that it might become 5ml of hits. And initial desiccation was performed immediately after spreading using the dryer 10 of this invention.

[0040] Moreover, the desiccation zone 14 was set as the range of 5-9mm, and spacing of the upper limit of the dashboard 28 divided into seven and a spreading film surface performed it. Moreover, the web 12 dried with the dryer 10 of this invention the first stage irradiated ultraviolet rays with the ultraviolet ray lamp 50 on the front face of a liquid crystal layer, carrying out continuation conveyance of the web 12 to which this

orientation film and a liquid crystallinity compound were applied, after passing the desiccation zone 46 adjusted to 100-degreeC, and the heating zone 48 adjusted to 130-degreeC and forming a nematic phase.

[0041] In addition, in the generating situation of spots of Table 1, it is shown that spots generated x and it is shown that spots did not generate O.

[0042]

[Table 1]

条件	各分割ゾーンの乾燥風の風速 (m/秒)							斑の発生状況	
	14A	14B	14C	14D	14E	14F	14G	ブロード斑	シャープ斑
1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	×	○
2	1.0	1.5	0.5	0.5	0.5	0.5	0.5	○	○
3	1.0	1.5	0.5	0.5	2.0	2.0	2.0	×	×

Consequently, as shown in Table 1, in the example 1 which carried out all the wind speeds of each division zone in the 0.5 samem/second, the broadcloth spots A occurred and the Sharp spots B were not generated. Moreover, the example 2 which carried out the wind speed of division zone 14B of 1.0m /and a degree for the wind speed of division zone 14A near the spreading machine 20 in 1.5m/second a second, and carried out the wind speed of the division zones 14C-14G after it in 0.5m/second did not generate the broadcloth spots A and the Sharp spots B, but was a good result. Moreover, the example 3 which carried out the wind speed of division zone 14B of 1.0m /and a degree for the wind speed of division zone 14A in 1.5m/second a second, carried out the wind speed of division zone 14C and D in 0.5m/second, and was set to division zone 14E, and F and G generated the broadcloth spots A and the Sharp spots B, and was the worst result.

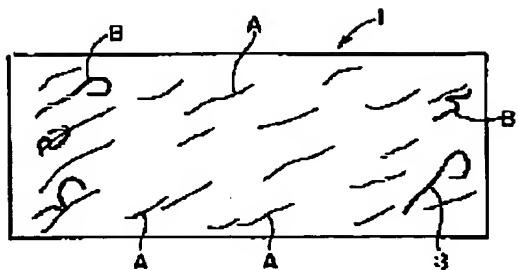
[0043] Thus, in order to control the spots (nonuniformity) generated in an initial desiccation process, it turned out that it is effective to divide a desiccation zone and to set it as the optimal wind speed with each exhaust air means while installing a dryer 10 immediately after spreading.

[0044]

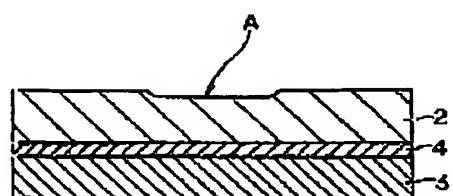
[Effect of the Invention] As explained above, according to the desiccation approach of the spreading film of this invention, and equipment, the spots (nonuniformity) generated in the initial desiccation process immediately after spreading can be controlled, and uniform desiccation can be performed. Therefore, like before, since it is not necessary to change the class of physical properties, such as viscosity of coating liquid, or solvent, the width of face of the class of coating liquid and the width of face of the class of solvent which can be used can be expanded.

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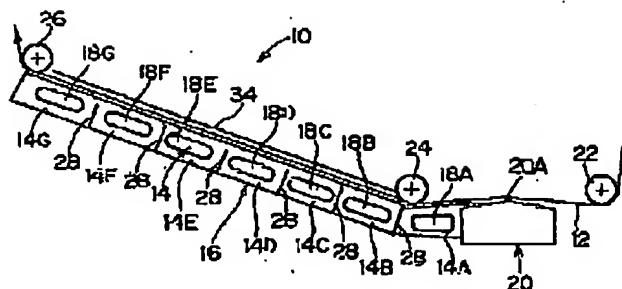
【図4】



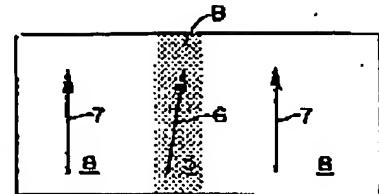
【図5】



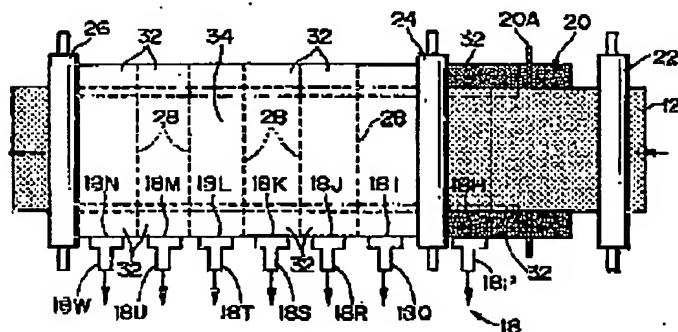
【図1】



【図6】



【図2】



【図3】

